

**WHAT IS CLAIMED:**

1. An optoelectronic connector comprising:

a) a mounting surface;

5 b) an array of optoelectronic devices adapted to the mounting surface, the optoelectronic devices having at least a first end;

c) an array of optical elements, the array of optical elements having at least a first end;

10 d) the first end of the array of optical elements positioned relative to the first end of the array of optoelectronic devices in such a manner that one or more optical elements is optically aligned to one or more optoelectronic devices; and

e) an adhesive dispensed between the first end of the array of optoelectronic devices and the first end of the array of optical elements, wherein the adhesive contacts the first end of the array of optoelectronic devices and the first end of the array of optical elements.

15 2. An apparatus as in claim 1, wherein the adhesive comprises an UV optical adhesive.

3. An apparatus as in claim 1, wherein the adhesive comprises a gel.

4. An apparatus as in claim 1, wherein the adhesive provides mechanical stability.

5. An apparatus as in claim 1, wherein the mounting surface comprises a printed circuit board.

20 6. An apparatus as in claim 5, wherein the mounting surface comprises a flexible printed circuit board.

7. An apparatus as in claim 1, wherein the optoelectronic devices comprise vertical cavity surface emitting lasers.

25 8. An apparatus as in claim 7, wherein the optoelectronic devices comprise oxide vertical cavity surface emitting lasers.

9. An apparatus as in claim 1, wherein the optoelectronic devices comprise photo-detectors.

10. An apparatus as in claim 1, wherein the optical elements are packages in a ferrule.

11. An apparatus as in claim 10, wherein the ferrule comprises at least a first end, the first end having a recess passing along an axis of the array of optical elements.
12. An apparatus as in claim 10, wherein the ferrule comprises at least a first end, the first end having a recess that is proximate to an end of the array of optical elements.
- 5 13. An apparatus as in claim 1, further comprising a second adhesive surrounding at least a portion of the array of optical elements, the second adhesive capable of mechanically stabilizing the array of optical elements to the mounting surface and capable of providing moisture and electrical shielding.
14. An apparatus as in claim 1, further comprising a dam adapted to the mounting surface, the dam surrounding the array of optical elements.
- 10 15. An apparatus as in claim 13, further comprising a moisture barrier that surrounds the second adhesive.
16. An apparatus as in claim 15, wherein the moisture barrier provides electrical shielding.
17. An apparatus as in claim 13, further comprising an electrical shielding that surrounds the second adhesive.
- 15 18. As apparatus as in claim 17, wherein the electrical shielding provides moisture shielding.
19. An apparatus as in claim 1, further comprising a driver chip or amplifier chip adapted to the mounting surface, the driver chip or amplifier chip in close proximity to the array of optoelectronic devices.
- 20 20. An apparatus as in claim 1, wherein the optical elements are optical fibers.
21. An apparatus as in claim 1, wherein the optical elements are lenses.
22. An apparatus as in claim 1, wherein the array of optical elements is a lenslet array.
23. An apparatus as in claim 1, wherein the optical elements are diffractive optical elements.
- 25 24. An apparatus as in claim 1, wherein the optical elements are filters.
25. An optoelectronic connector comprising:
- a) a mounting surface;

b) an array of optoelectronic devices adapted to the mounting surface, the optoelectronic devices having at least a first end.

c) an array of optical elements, the array of optical elements having at least a first end;

5 d) the first end of the array of optical elements positioned relative to the first end of the array of optoelectronic devices in such a manner that one or more optical elements is optically aligned to one or more optoelectronic devices; and

e) a first non-opaque material dispensed between the first end of the array of optoelectronic devices and the first end of the array of optical elements, wherein the first non-opaque material contacts the first end of the array of optoelectronic devices and the first end of the array of optical elements.

26. An apparatus as in claim 25, wherein the first non-opaque material comprises an adhesive.

27. An apparatus as in claim 26, wherein the first non-opaque material comprises an UV optical adhesive.

28. An apparatus as in claim 25, wherein the first non-opaque material comprises a gel.

29. An apparatus as in claim 25, wherein the first non-opaque material provides mechanical stability.

30. An apparatus as in claim 25, wherein the mounting surface comprises a printed circuit board.

31. An apparatus as in claim 30, wherein the mounting surface comprises a flexible printed circuit board.

32. An apparatus as in claim 25, wherein the optoelectronic devices comprise vertical cavity surface emitting lasers.

33. An apparatus as in claim 32, wherein the optoelectronic devices comprise oxide vertical cavity surface emitting lasers.

34. An apparatus as in claim 25, wherein the optoelectronic devices comprise photo-detectors.

35. An apparatus as in claim 25, wherein the optical elements are packaged in a ferrule.

36. An apparatus as in claim 35, wherein the ferrule comprises at least a first end, the first end having a recess passing along an axis of the array of optical elements.
37. An apparatus as in claim 35, wherein the ferrule comprises at least a first end, the first end having a recess that is proximate to an end of the array of optical elements.
- 5 38. An apparatus as in claim 25, further comprising a second adhesive surrounding at least a portion of the array of optical elements, the second adhesive capable of mechanically stabilizing the array of optical elements to the mounting surface and capable of providing moisture and electrical shielding.
39. An apparatus as in claim 25, further comprising a dam adapted to the mounting  
10 surface, the dam surround the array of optical elements.
40. An apparatus as in claim 38, further comprising a moisture barrier that surrounds the second adhesive.
41. An apparatus as in claim 40, wherein the moisture barrier provides electrical shielding.
42. An apparatus as in claim 38, further comprising an electrical shielding that surrounds  
15 the second adhesive.
43. An apparatus as in claim 42, wherein the electrical shielding provides moisture shielding.
44. An apparatus as in claim 25, further comprising a driver chip or amplifier chip adapted to the mounting surface, the driver chip or amplifier chip in close proximity to the array of  
20 optoelectronic devices.
45. An apparatus as in claim 25, wherein the optical elements are optical fibers.
46. An apparatus as in claim 25, wherein the optical elements are lenses.
47. An apparatus as in claim 25, wherein the array of optical elements is a lenslet array.
48. An apparatus as in claim 25, wherein the optical elements are diffractive optical  
25 elements.
49. An apparatus as in claim 25, wherein the optical elements are filters.
50. An optoelectronic connector comprising:
- a) a mounting surface;

b) an array of optoelectronic devices adapted to the mounting surface, the optoelectronic devices having at least a first end;

c) an array of optical elements, the array of optical elements having at least a first end;

5 d) the first end of the array of optical elements positioned relative to the first end of the array of optoelectronic devices in such a manner that one or more optical elements in optically aligned to one or more optoelectronic devices; and

e) a solidifying material surrounding at least the array of optical elements, the solidifying material capable of mechanically stabilizing the array of optical elements to the  
10 mounting surface.

51. An apparatus as in claim 50, wherein the solidifying material encapsulates at least one electrical or optoelectronic component adapted to the mounting surface.

52. An apparatus as in claim 50, wherein the solidifying material is capable of providing moisture or electrical shielding.

15 53. An apparatus as in claim 50, wherein the solidifying material comprises an adhesive.

54. An apparatus as in claim 53, wherein the solidifying material comprises an UV optical adhesive.

55. An apparatus as in claim 50, wherein the solidifying material is capable of providing an optical path and is capable of providing mechanical stability.

20 56. An apparatus as in claim 50, wherein the solidifying material is capable of functioning as an attenuator.

57. An apparatus as in claim 50, wherein the mounting surface comprises a printed circuit board.

25 58. An apparatus as in claim 57, wherein the mounting surface comprises a flexible printed circuit board.

59. An apparatus as in claim 50, wherein the optoelectronic devices comprise vertical cavity surface emitting lasers.

60. An apparatus as in claim 59, wherein the optoelectronic devices comprise oxide vertical cavity surface emitting lasers.

61. An apparatus as in claim 50, wherein the optoelectronic devices comprise photo-detectors.

62. An apparatus as in claim 50, wherein the optical element are packaged in a ferrule.

63. An apparatus as in claim 62, wherein the ferrule comprises at least a first end, the first  
5 end having a recess passing along an axis of the array of optical elements.

64. An apparatus as in claim 62, wherein the ferrule comprises at least a first end, the first  
end having a recess that is proximate to an end of the array of optical elements.

65. An apparatus as in claim 50, further comprising a driver chip or amplifier chip adapted  
to the mounting surface, the driver chip or amplifier chip in close proximity to the array of  
10 optoelectronic devices.

66. An apparatus as in claim 50, wherein the optical elements are optical fibers.

67. An apparatus as in claim 50, wherein the optical elements are lenses.

68. An apparatus as in claim 50, wherein the array of optical elements is a lenslet array.

69. An apparatus as in claim 50, wherein the optical elements are diffractive optical  
15 elements.

70. An apparatus as in claim 50, wherein the optical elements are filters.

71. An optoelectronic connector comprising:

a) a mounting surface;  
b) an array of optoelectronic devices adapted to the mounting surface, the  
20 optoelectronic devices having at least a first end;

c) an array of optical elements, the array of optical elements having at least a first  
end;

d) the first end of the array of optical elements positioned relative to the first end  
of the array of optoelectronic devices in such a manner that one or more optical elements is  
25 optically aligned to one or more optoelectronic devices; and

e) a gap formed between the first end of the array of optoelectronic devices and  
the first end of the array of optical elements.

72. An apparatus as in claim 71, wherein the mounting surface comprises a printed circuit board.

73. An apparatus as in claim 71, further comprising a spacer adapted to the mounting surface, the spacer capable of forming the gap between the first end of the array of optoelectronic devices and the first end of the array of optical elements.

74. An apparatus as in claim 71, wherein the mounting surface comprises a flexible printed circuit board.

75. An apparatus as in claim 71, wherein the optoelectronic devices comprise vertical cavity surface emitting lasers.

76. An apparatus as in claim 71, wherein the optoelectronic devices comprise oxide vertical cavity surface emitting lasers.

77. An apparatus as in claim 71, wherein the optoelectronic devices comprise photo-detectors.

78. An apparatus as in claim 71, wherein the optical elements are packaged in a ferrule.

79. An apparatus as in claim 78, wherein the ferrule comprises at least a first end, the first end having a recess passing along an axis of the array of optical elements.

80. An apparatus as in claim 78, wherein the ferrule comprises at least a first end, the first end having a recess that is proximate to an end of the array of optical elements.

81. An apparatus as in claim 71, wherein the gap optimizes the optical coupling and alignment tolerances for a given set of optoelectronic devices and optical element characteristics.

82. An apparatus as in claim 71, further comprising a first adhesive dispensed between the first end of the array of optoelectronic devices and the first end of the array of optical elements, wherein the first adhesive contacts the first end of the array of optoelectronic devices and the first end of the array of optical elements.

83. An apparatus as in claim 82, wherein the first adhesive is a gel.

84. An apparatus as in claim 71, further comprising a dam adapted to the mounting surface, the dam surrounding the array of optical elements.

85. An apparatus as in claim 71, further comprising a second adhesive surrounding at least a portion of the array of optical elements, the second adhesive is capable of mechanically stabilizing the array of optical elements to the mounting surface and is capable of providing moisture and electrical shielding.

5 86. An apparatus as in claim 85, further comprising a moisture barrier that surrounds the second adhesive.

87. An apparatus as in claim 86, wherein the moisture barrier provides electrical shielding.

88. An apparatus as in claim 85, further comprising an electrical shielding that surrounds the second adhesive.

10 89. An apparatus as in claim 88, wherein the electrical shielding provides moisture shielding.

90. An apparatus as in claim 71, further comprising a driver chip or amplifier chip adapted to the mounting surface, the driver chip or amplifier chip in close proximity to the array of optoelectronic devices.

15 91. An apparatus as in claim 71, wherein the optical elements are optical fibers.

92. An apparatus as in claim 71, wherein the optical elements are lenses.

93. An apparatus as in claim 71, wherein the array of optical elements is a lenslet array.

94. An apparatus as in claim 71, wherein the optical elements are diffractive optical elements.

20 95. An apparatus as in claim 71, wherein the optical elements are filters.

96. A method of transmitting an electronic signal over a fiber optic line, comprising the steps of:

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- a) receiving an electronic signal from a circuit board;
  - b) driving an array of optoelectronic devices in response to the electronic signal in such a manner that at least one optoelectronic device emits light; and
  - c) passing the light through an interstitial space into an array of optical fibers.

97. A method according to claim 96, wherein the interstitial space is filled with a non-opaque material.

98. A method as in claim 96, wherein the interstitial space is filled with an adhesive.
99. A method as in claim 96, wherein the interstitial space is filled with an UV optical adhesive.
100. A method as in claim 96, wherein the interstitial space is filled with gel, wherein the gel is capable of providing an optical path and is capable of providing mechanical stability.
101. A method as in claim 96, further comprising at least one optical element inserted in the interstitial space.
102. An apparatus as in claim 101, wherein the optical elements is an optical fiber.
103. An apparatus as in claim 101, wherein the optical element is a lens.
104. An apparatus as in claim 101, wherein the optical element is a lenslet array.
105. An apparatus as in claim 101, wherein the optical element is a diffractive optic array.
106. An apparatus as in claim 101, wherein the optical element is a filter.
107. A method of receiving an optical signal from a fiber optic line, comprising the steps of:
- a) receiving an optical signal from an array of optical fibers;
  - b) passing the optical signal through an interstitial space and onto an array of photodetectors, the photodetectors capable of converting the optical signal into an electrical signal;
  - c) amplifying the electrical signal; and
  - d) transmitting the electrical signal to a circuit board.
108. A method according to claim 107, wherein the interstitial space is filled with a non-opaque material.
109. A method as in claim 107, wherein the interstitial space is filled with an adhesive.
110. A method as in claim 107, wherein the interstitial space is filled with an UV optical adhesive.
111. A method as in claim 107, wherein the interstitial space is filled with a gel, wherein the gel is capable of providing an optical path and to provide mechanical stability.

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112. A method as in claim 107, further comprising at least one optical element inserted in the interstitial space.

113. An apparatus as in claim 112, wherein the optical element is an optical fiber.

114. An apparatus as in claim 112, wherein the optical element is a lens.

5 115. An apparatus as in claim 112, wherein the optical element is a lenslet array.

116. An apparatus as in claim 112, wherein the optical element is a diffractive optic array.

117. An apparatus as in claim 112, wherein the optical element is a filter.

118. An optoelectronic connector comprising:

a) a mounting surface.

10 b) an array of optoelectronic devices adapted to the mounting surface, the optoelectronic devices having a least a first end;

c) an array of optical elements, the array of optical elements having at least a first end;

15 d) the first end of the array of optical elements proximate to the first end of the array of optoelectronic devices in such a manner that one or more optical elements is optically aligned to one or more optoelectronic devices; and

e) a spacer adapted to the mounting surface, a first end of the spacer proximate to the first end of the array of optical elements.

20 119. An apparatus as in claim 118, wherein the spacer is capable of creating a interstitial space between the first end of the array of optical elements and the first end of the array of optoelectronic devices.

25 120. An apparatus as in claim 118, further comprising a first non-opaque material dispensed between the first end of the array of optoelectronic devices and the first end of the array of optical elements and dispensed on at least a portion of the spacer, wherein the first non-opaque material contacts the first end of the array of optoelectronic devices, the first end of the array of optical elements and at least a portion of the spacer.

121. An apparatus as in claim 120, wherein the first non-opaque material comprises an adhesive.

122. An apparatus as in claim 121, wherein the first non-opaque material comprises an UV optical adhesive.
123. An apparatus as in claim 118, wherein the first non-opaque material comprises a gel.
124. An apparatus as in claim 118, wherein the first non-opaque material is capable of providing an optical path and to provide mechanical stability.
125. An apparatus as in claim 118, wherein the mounting surface comprises a printed circuit board.
126. An apparatus as in claim 125, wherein the mounting surface comprises a flexible printed circuit board.
127. An apparatus as in claim 118, wherein the optoelectronic devices comprise vertical cavity surface emitting lasers.
128. An apparatus as in claim 127, wherein the optoelectronic devices comprise oxide vertical cavity surface emitting lasers.
129. An apparatus as in claim 118, wherein the optoelectronic devices comprise photo-detectors.
130. An apparatus as in claim 118, wherein the optical elements are packaged in a ferrule.
131. An apparatus as in claim 130, wherein the ferrule comprises at least a first end, the first end having a recess passing along an axis of the array of optical elements.
132. An apparatus as in claim 131, wherein the ferrule comprises at least a first end, the first end having a recess that is proximate to an end of the array of optical elements.
133. An apparatus as in claim 118, further comprising a dam adapted to the mounting surface, the dam surrounding the array of the optical elements.
134. An apparatus as in claim 118, further comprising a second adhesive surrounding at least a portion of the array of optical elements, the second adhesive is capable of mechanically stabilizing the array of optical elements to the mounting surface and is capable of providing moisture and electrical shielding.
135. An apparatus as in claim 134, further comprising a moisture barrier that surrounds the second adhesive.

